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THIRD ANNUAL REPORT IN THE FIELDS OF AERONAUTICS AND SPACE

MESSAGE

FROM

THE PRESIDENT OF THE UNITED STATES

TRANSMITTING

THE THIRD ANNUAL REPORT ON THE NATION'S ACTIVITIES IN THE FIELDS OF AERONAUTICS AND SPACE, PURSUANT TO SECTION 206(B) OF THE NATIONAL AERONAUTICS AND SPACE ACT OF 1958

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CHAPTER II

DEPARTMENT OF DEFENSE

INTRODUCTION

The Department of Defense (DOD) continues to be primarily interested in applying the new capability for space flight to achieve a more efficient military force for the United States and its allies. Space efforts of the Department are integral to the over-all military program, complementing or supplementing other military activities.

During 1960, the tempo of military space activities increased. Several noteworthy successes were achieved, among them: 1) recovery of capsules from orbit; 2) launching of multiple payloads from one vehicle; and 3) feasibility demonstrations of satellites for accurate all-weather navigation and communications relay.

The military departments cooperate in developing space applications under the close supervision of the Director of Defense Research and Engineering. Military space projects are assigned to appropriate departments after due consideration of their particular interests, responsibilities, or special competence. For example, development of reconnaissance and early warning satellites was assigned to the Air Force, navigational satellites to the Navy, and communication satellites to the Army. Other projects are, or will be, handled in a similar manner. Space activities are closely coordinated between departments concerned. The Air Force is responsible for launching all military satellites.

To insure close working relationships, and to integrate DOD and NASA space activities into a single national effort, a NASA-DOD Aeronautics and Astronautics Coordinating Board was established. The Board is co-chaired by the Deputy Administrator of NASA and the Director of Defense Research and Engineering of DOD. Through the Board membership and six functional area panels, projects and project support are planned, reviewed, defined, and adjusted to eliminate duplications and to augment effort in areas requiring it.

Twenty-one launch attempts were made with 12 successfully attaining orbit.

A brief summary of the major programs follows:

DISCOVERER

Particularly emphasized was the DISCOVERER satellite program, testing components, propulsion, and guidance systems and techniques to be utilized in various U.S. space projects. Capsule recovery is foremost among techniques being studied. On August 11, the U.S. recovered from the Pacific Ocean a DISCOVERER capsule that had been in orbit about a day. This event marked the first time that any nation had successfully recovered a man-made object after it had orbited the earth. The capsule was donated to the Smithsonian Institution. An American flag taken from the payload was donated to the Eisenhower Memorial Museum, Abilene, Kan.

In later experiments, additional U.S. capsules* were recovered in mid-air by aircraft equipped with slings.

Included in the DISCOVERER Program is the AGENA upper stage vehicle, which is also used as a satellite vehicle for MIDAS, SAMOS, and other programs. AGENA has proven to be a highly reliable vehicle. The propulsion system has never failed. The stabilization system, which makes recovery possible, is the first to maintain an earth-oriented attitude. AGENA has also exhibited accuracy and effectiveness. The latest version, AGENA B, with double the tank capacity and twice the burning time of AGENA A, was successfully tested on DISCOVERER XVII in November. Everything worked according to plan, including ejection of the capsule from AGENA, and mid-air recovery after 50 hours of orbital flight.

TRANSIT

The TRANSIT satellite navigation system, initiated early in 1958, is in the second phase of the program: 1) developing shipboard navigation gear, 2) increasing system reliability, 3) improving accuracy--including research and experiments in the refraction and geodetic areas, 4) simplifying system and shipboard operation, and 5) studying aircraft navigational systems and making preliminary design.

TRANSIT satellites placed in orbit were completely successful. All subsystems operated properly and all four radios transmitted normally. Excellent refraction data and limited data on the shape of the earth were obtained. Position

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* Total of three mid-air recoveries to date.

determination experiments from these satellites have proven TRANSIT fixes to be accurate to within one-quarter of a mile.

Plans are under way for an operational, completely passive system to insure reliable, all-weather navigation. Ships anywhere on the globe will be able to receive not only navigational information but also the exact times and the predicted orbits of the satellites. Voyages for ships of all nations can thus become safer and more efficient.

GREB

The Solar Radiation Satellite GREB (Galactic Radiation Experiment Background) launched pick-a-back on TRANSIT, transmits continuous measurements of solar activity in the X-ray and ultra-violet radiation bands. These solar "weather reports," correlated with a host of ground level observations, help to unravel the mysteries of ionospheric behavior and the mechanisms of solar storms.

This satellite system has contributed significantly to scientific knowledge. For example, in August there occurred a solar flare lasting 18 minutes. Just as the flare began, a satellite came within range of a ground receiving station, and six minutes of clear signals depicted the history of the way that ultraviolet and X-ray emission developed. The sequence of events in the early life of a solar storm is extremely rapid. No previous observations provided a continuous record of the first minutes of a solar storm's birth.

MIDAS

The goal of the MIDAS project is development of a reliable, operational satellite-borne missile defense alarm system. MIDAS will place in orbit payloads having infrared detection scanners that can detect the launching of ballistic missiles.

In 1960, the first two research and development MIDAS satellites were launched from the Atlantic Missile Range (AMR). The second launch, which placed an infrared scanning satellite into orbit for the first time, obtained valuable infrared background data relating to the earth's surface.

ARGUS

The ARGUS experiments, in which nuclear [redacted] were set off in the exosphere, were successfully completed in 1959. However, data are still being analyzed and used in other space

research and air defense programs, for example, VELA (see pp. 27-28). The results continue to shed light on the fundamental nature of the Van Allen belts (Great Radiation Region) and on the earth's magnetic field.

NOTUS

This project, for developing a communications system utilizing satellites to provide long-range radio communications links, was reoriented to emphasize two programs: COURIER and ADVENT.

COURIER demonstrated the feasibility of a delayed repeater satellite to relieve crowded point-to-point communications when the COURIER 1B satellite was successfully launched in October. Vast quantities of information were relayed between the ground stations at Puerto Rico and New Jersey. The COURIER portion of the NOTUS project is now completed.

ADVENT is intended to demonstrate the feasibility of an instantaneous repeater located at a fixed position above the earth, revolving at the same speed as the earth. The project should provide broadband, point-to-point communication and ground-to-aircraft communication. Organization for management was completed and the principal program contractors were selected.

SHEPHERD

The objective of this program is to obtain, at the earliest practicable date, a space surveillance tracking system that can satisfy military and other requirements. Present systems are SPASUR (Space Surveillance System) and SPACETRACK (National Space Surveillance Control Center); both were placed under control of the Commander-in-Chief, Continental Air Defense Command, in November.

SPASUR, a network of radars, can detect and determine the orbit of any objects in space passing over the United States at altitudes up to 1,000 miles, regardless of whether they are sending out signals. As an exemple of the capability of this system, early in 1960 SPASUR detected an unknown object in orbit around the earth. The orbit was determined and, from this, the object was identified as a part of a previously launched DISCOVERER satellite vehicle that had been "lost" for some time.

The primary functions of SPACETRACK at Bedford, Mass., are to calculate orbital elements of all satellites and to maintain a catalog of these elements and distribute the information to the military services, intelligence agencies and the scientific community. The center was constructed in 1959 and began operation in January 1960. Data are received from many sources, including SPASUR. Information is given out on a cooperative basis. A study was completed of anticipated future requirements in space detection, tracking and cataloging to aid in determining future requirements for an operational military system.

LONGSIGHT

The purpose of Project LONGSIGHT was to find and remedy serious short- and long-term gaps in study and research relating to foreseen military needs in space technology. During the report period, the study was concluded. A sub-project, ORION, continues. It is a study of the feasibility of propelling very large payloads through space by means of a series of nuclear explosions. Early in 1960, after initial engineering feasibility studies, the project was reoriented toward answering basic questions to determine performance. Engineering studies were continued at a level that should give approximate estimates of design parameters. In addition, the Atomic Energy Commission laboratories were requested to aid in design studies of nuclear devices for propulsion vehicles of the ORION type.

SAMOS

Project SAMOS is a research and development program to determine the capabilities for making observations of the earth from satellites. The first SAMOS flight test was in October, when SAMOS I was launched from the Pacific Missile Range (PMR). However, due to equipment malfunction during launch, orbit was not attained. Research and development on essential components is continuing.

VELA

The Department of Defense, in collaboration with AEC, NASA, and the Departments of Commerce and Interior, has developed Project VELA, whose objective is a system for

detecting nuclear explosions, both underground and at high altitudes. VELA is subdivided into three research and development programs:

1) VELA Uniform: detection of underground nuclear explosions;
2) VELA Sierra: ground-based detection of nuclear tests in space; and
3) VELA Hotel: satellite-based detection of nuclear tests in space.

SAINT

The Satellite Inspector System (SAINT) program, intended to develop and demonstrate a rendezvous and inspection satellite, will place inspection payloads in orbit in close proximity to specified targets.

LORRAINE

Research in advanced energy conversion is being highlighted by the establishment of this new project. On a continuing basis, LORRAINE will support advanced program needs within the Department of Defense. Progress continued on energy conversion techniques and energy storage and collection.

BLUE SCOUT

The BLUE SCOUT program is directed toward developing and standardizing an economical, versatile, and reliable test vehicle to improve components, subsystems, and specialized techniques related to military space activities and ballistic missile development.

Available facilities at Cape Canaveral were used to launch two BLUE SCOUT vehicles. On September 21, one achieved a probe altitude estimated at more than 14,000 miles during a seven-hour flight. The second, launched on November 8, blew up after 68 seconds.

PROJECT TRANSFER TO NASA

In March, all administrative and technical responsibilities for Project Saturn were transferred to NASA.*

* See Chapter 1

DYNA-SOAR AEROSPACE SYSTEM DEVELOPMENT*

The Dyna-Soar system development is a joint DOD-NASA program, financed and administered by DOD, to construct and test a manned, maneuverable aerospace vehicle that will explore hypersonic flight up to orbital speeds. The project will establish and confirm the basic technology to develop weapons systems or other vehicles capable of orbit, atmospheric entry, and maneuver to a conventional landing at a pre-selected air base.

After an intensive three-month review of technical features, the program was approved in April. The glider, the launch vehicle, and launch vehicle engines were contracted for.

Studies covering more than 20 areas were completed. A comprehensive wind tunnel test program to develop performance, stability, and control data for a range of Mach 0.3 to Mach 18 was conducted. Structures and materials are being refined and tested at an accelerated rate.

SPACE FLIGHT SUPPORTING RESOURCES

During 1960, 10 NASA and 21 DOD space vehicles were launched from AMR, and from the Vandenberg AFB and Pt. Arguello launch areas of PMR, utilizing the support of the National Missile Ranges. To a substantial extent, these launches were supported by existing facilities and equipment initially provided for missile requirements. In a number of cases, however, facilities have been augmented with equipment to support the newer upper-stage rocket engines.

Construction was begun and is proceeding at AMR to provide a launch capability for the Atlas-Centaur combination and the Saturn vehicle.

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* See Chapter 1